THE JOURNAL OF AGRICULTURAL SCIENCE

EDITED BY

R. B. AUSTIN, D.SC., Plant Breeding Institute, Cambridge

B. W. BACHE, M.A., PH.D., C.CHEM., F.R.S.C., Department of Applied Biology, Cambridge

PROF. SIR J. W. L. BEAMENT, SC.D., F.R.S., Department of Applied Biology, Cambridge

G. D. H. BELL, C.B.E., PH.D., SC.D.(*h.c.*), D.SC.(*h.c.*), F.R.S., 6 Worts Causeway, Cambridge

SIR K. L. BLAXTER, PH.D., N.D.A. (HONS.), D.SC., F.R.S.E., F.R.S., Rowett Research Institute. Bucksburn, Aberdeen

PROF. A. D. CARE, D.SC., M.R.C.V.S., Department of Animal Physiology and Nutrition, Leeds

J. A. CURRIE, PH.D., Rothamsted Experimental Station, Harpenden

S. K. ELTRINGHAM, PH.D., Department of Applied Biology, Cambridge

PROF. J. L. JINKS, C.B.E., D.SC., F.I.BIOL., F.R.S., Department of Genetics, Birmingham

D. B. LINDSAY, B.SC., M.A., D.PHIL., Agricultural and Food Research Council, Institute of Animal Physiology, Babraham, Cambridge

PROF. J. B. OWEN, B.SC., PH.D., M.A., Department of Agriculture, Bangor

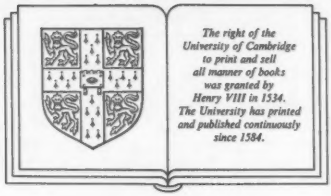
W. J. RIDGMAN, M.A., Department of Applied Biology, Cambridge

PROF. E. W. RUSSELL, C.M.G., D.SC., F.INST.P., Department of Soil Science, University of Reading

F. YATES, C.B.E., SC.D., F.R.S., Rothamsted Experimental Station, Harpenden

VOLUME 103

CAMBRIDGE UNIVERSITY PRESS
CAMBRIDGE
LONDON NEW YORK NEW ROCHELLE
MELBOURNE SYDNEY
1984



PUBLISHED BY

THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE

The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, N.Y. 10022
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

© Cambridge University Press 1984

Printed in Great Britain at the University Press, Cambridge

Contents

PART 1 (AUGUST 1984)

PAGE

NEAL, HEATHER D. ST C., THOMAS, C. and COBBY, J. M. Comparison of equations for predicting voluntary intake by dairy cows 1

LIN, C. S. and BINNS, M. R. Working rules for determining the plot size and numbers of plots per block in field experiments 11

BUTLER-HOGG, B. W. Growth patterns in sheep: changes in the chemical composition of the empty body and its constituent parts during weight loss and compensatory growth . 17

MCGRATH, S. P. Metal concentrations in sludges and soil from a long-term field trial . . 25

MACKIE, R. I., GILCHRIST, FRANCES M. C. and HEATH, SUZETTE. An *in vivo* study of ruminal micro-organisms influencing lactate turnover and its contribution to volatile fatty acid production 37

SINGH, R. P. and SINGH, S. A study of interaction of additive, dominance and epistatic gene effects with micro- and macro-environments in two tomato triple test crosses . . 53

BARRACLOUGH, P. B. and LEIGH, R. A. The growth and activity of winter wheat roots in the field: the effect of sowing date and soil type on root growth of high-yielding crops . 59

IQTIDAR, A. and REHMAN, S. F. Effect of boron on the protein and amino acid composition of wheat grain 75

SUTTLE, N. F., ABRAHAMS, P. and THORNTON, I. The role of a soil × dietary sulphur interaction in the impairment of copper absorption by ingested soil in sheep 81

SAITO, SIU M. T., MONTANHEIRO, MARIA NAZARETH S., VICTÓRIA, R. L. and REICHARDT, K. The effects of N fertilizer and soil moisture on the nodulation and growth of *Phaseolus vulgaris* 87

BONETTI, R., MONTANHEIRO, MARIA NAZARETH S. and SAITO, SIU M. T. The effects of phosphate and soil moisture on the nodulation and growth of *Phaseolus vulgaris* . . . 95

ABRAHAM, C. T. and SINGH, S. P. Weed management in sorghum–legume intercropping systems 103

IREMIREN, G. O. The growth and nutrient content of polybag oil-palm seedlings as affected by mulch materials and time of their application 117

KEMPTON, R. A. The use of biplots in interpreting variety by environment interactions . 123

FRISCH, J. E. and VERCOE, J. E. An analysis of growth of different cattle genotypes reared in different environments 137

AMIR, D., ROSENBERG, MIRIAM and SCHINDLER, H. Oestrous and ovarian activities of Finn-cross ewes during the post-partum and the seasonal anoestrous periods . . . 155

JENNINGS, P. G. and HOLMES, W. Supplementary feeding of dairy cows on continuously stocked pasture 161

PHIPPS, R. H., BINES, J. A., FULFORD, ROSEMARY J. and WELLER, R. F. Complete diets for dairy cows: a comparison between complete diets and separate ingredients . . . 171

HEGAZI, E. M. and SHABAAN, M. A. Competition and the superparasitism of *Spodoptera littoralis* (Boisd.) larvae by *Microplitis rufiventris* Kok. 181

GOSS, M. J., HOWSE, K. R., VAUGHAN-WILLIAMS, JUDITH M., WARD, M. A. and JENKINS, W. Water use by winter wheat as affected by soil management 189

PAGE

WILMAN, D. and PEARSE, P. JOY. Effects of applied nitrogen on grass yield, nitrogen content, tillers and leaves in field swards 201

KHALIFA, F. M. Effect of spacing on growth and yield of sunflower (*Helianthus annuus* L.) under two systems of dry farming in Sudan 213

WELLER, R. F., PHIPPS, R. H. and GRIFFITH, E. S. The nutritive value of normal and brown midrib-3 maize 223

TOWNER, G. D. The redistribution of a surface layer of solute during the drainage of a soil profile to field capacity 229

ELLIOTT, R., BRANDON, JANELLE R., KENNY, G. J. and EVANS, T. R. Excretion patterns of 3-hydroxy-4(1H) pyridone (DHP) by steers fed a high energy and a high-fibre diet supplemented with *Leucaena leucocephala* 239

SHORT NOTES

FRANCE, J. and DHANOA, M. S. On estimating lactation yield 245

CHAUHAN, Y. S. and BHARGAVA, S. C. Physiological analysis of growth and yield variation of rapeseed and mustard 249

POWELL, W. and WOOD, W. An assessment of the *hap* initiator gene for haploid production in *Hordeum vulgare* 253

PART 2 (OCTOBER 1984)

BRAGG, P. L., RUBINO, P., HENDERSON, F. K. G., FIELDING, W. J. and CANNELL, R. Q. A comparison of the root and shoot growth of winter barley and winter wheat, and the effect of an early application of chlormequat 257

GOULDING, K. W. T. The availability of potassium in soils to crops as measured by its release to a calcium-saturated cation exchange resin 265

ARORA, C. L., HUNDAL, H. S. and TAKKAR, P. N. Nutrient indexing of lowland rice crop in Ludhiana 277

FIELD, A. C., WOOLLIAMS, J. A., DINGWALL, R. A. and MUNRO, C. S. Animal and dietary variation in the absorption and metabolism of phosphorus by sheep 283

KEMPTON, R. A. and LOCKWOOD, G. Inter-plot competition in variety trials of field beans (*Vicia faba* L.) 293

MENDHAM, N. J., RUSSELL, J. and BUZZA, G. C. The contribution of seed survival to yield in new Australian cultivars of oil-seed rape (*Brassica napus*) 303

WILSON, S. Changes in propionate and glucose metabolism during synchronization of oestrus in ewes 317

PHIPPS, R. H., BINES, J. A., WELLER, R. F. and THOMAS, JOANNE. Complete diets for dairy cows: the effect of energy concentration and change in energy concentration of a complete diet on intake and performance of lactating dairy cows 323

EL MANHALY, M. A., FADAYOMI, O., ABAYOMI, Y. A. and OLOFINBOBA, M. O. Control of flowering in two commercial sugar-cane varieties 333

BROWN, J., CALIGARI, P. D. S., MACKAY, G. R. and SWANN, G. E. L. The efficiency of seedling selection by visual preference in a potato breeding programme 339

MCCLUSKEY, J. G., ALLISON, M. J., DUNCAN, H. J. and JARVIS, M. C. Isolation of anatomically defined cell walls from fodder kale, and their contributions to determining the *in vitro* cellulase digestibility of the whole plant 347

PAGE

WILLIAMS, INGRID H. The concentrations of air-borne rape pollen over a crop of oil-seed rape (*Brassica napus* L.) 353

BILASPURI, G. S. and GURAYA, S. S. The seminiferous epithelial cycle and spermatogenesis in goats (*Capra hircus*) 359

RYDER, M. L. and GABRA-SANDERS, THEA. A note on fleece cotting (felting) in sheep . . 369

YADAV, S. K., SINGH, S. P. and BHAN, V. M. Crop–weed competition studies in groundnut (*Arachis hypogaea* L.) 373

REITH, J. W. S., INKSON, R. H. E., CALDWELL, K. S., SIMPSON, W. E. and ROSS, J. A. M. Effect of soil type and depth on crop production 377

HAMILL, MADELINE and CAMLIN, M. S. The measurement of leaf colour in grasses . . 387

FORD, MARGARET A., AUSTIN, R. B., GREGORY, R. S. and MORGAN, C. L. A comparison of the grain and biomass yields of winter wheat, rye and triticale 395

PEARSE, P. JOY and WILMAN, D. Effects of applied nitrogen on grass leaf initiation, development and death in field swards 405

WALKEY, D. G. A. and WARD, C. M. The reaction of celery (*Apium graveolens* L.) to infection by celery mosaic virus 415

BASS, J. J., CARTER, W. D., WOODS, E. G. and MOORE, R. W. Evaluation of the ability of two carcass conformation systems to predict carcass composition of sheep . . . 421

GREGORY, P. J., SHEPHERD, K. D. and COOPER, P. J. Effects of fertilizer on root growth and water use of barley in northern Syria 429

BARRACLOUGH, P. B. The growth and activity of winter wheat roots in the field: root growth of high-yielding crops in relation to shoot growth 439

GRIFFITH, R. L., ALLEN, E. J., O'BRIEN, SUSAN A. and O'BRIEN, P. J. Comparisons of growth and early yields of potato varieties of contrasting maturity classification at three sites 443

MACLEOD, N. A., ØRSKOV, E. R. and ATKINSON, T. The effect of pH on the relative proportions of ruminal volatile fatty acids in sheep sustained by intragastic infusions . . . 459

BRISTOW, A. W. and GARWOOD, E. A. Deposition of sulphur from the atmosphere and the sulphur balance in four soils under grass 463

SHORT NOTES

HYND, P. I. Effects of starch fermentation products on roughage digestion 469

STARR, CAROL, YOUNG, JACQUELINE and SMITH, D. B. Measurement of the nitrogen content of plant breeding material using a Carlo Erba Nitrogen Analyser 471

RAY, P. K., MISHRA, S. and MISHRA, S. S. Specific gravity of tubers in relation to productivity of some sweet potato genotypes 475

ELLIOTT, R., MILTON, J. T. B., GORDON, G. H. and BLAMEY, F. P. C. Effect of L-mimosine in artificial diet on the growth and development of *Heliothis punctiger* larvae . . . 477

PART 3 (DECEMBER 1984)

ABOUL-NAGA, A. M. and ABOUL-ELA, M. B. Oestrous activity of Egyptian fat-tailed Ossimi ewes raised at different locations 481

SEKHON, H. S. and SINGH, M. Effect of mechanical and chemical seed treatments on the number and size of seed tubers and yield of potatoes 487

AMUBODE, F. O. and FETUGA, B. L. Hepatic xanthine dehydrogenase and plasma uric acid in broiler chickens fed various amounts of dietary methionine, protein and energy . . 497

PAGE

FADAYOMI, O., ABAYOMI, Y. A. and EL-MANHALY, M. A. Efficacy of selected herbicide mixtures for weed control in sugar cane 503

BHARDWAJ, H. L. and WEAVER, J. B. JR., Combining-ability analysis in cotton for agronomic characters, fruiting efficiency, photosynthesis and bollworm resistance 511

PINK, D. A. C. and WALKEY, D. G. A. Resistance in marrow (*Cucurbita pepo* L.) to different strains of cucumber mosaic virus 519

RASTOGI, K. B. and SAINI, S. S. Inheritance of seed shape and resistance to Ascochyta blight in pea (*Pisum sativum* L.) 523

BENJAMIN, L. R. The relative importance of some different sources of plant-weight variation in drilled and transplanted leeks 527

PRASAD, R., SINGH, S. and DE, R. Effect of time and method of application on the relative efficiency of prilled urea and urea super granules for rice 539

SINGH, S. and DAHIYA, M. S. Detection and estimation of components of genetic variation and genotype × environment interaction in three wheat crosses 543

JANES, A. N., PARKER, D. S., WEEKES, T. E. C. and ARMSTRONG, D. G. Mesenteric venous blood flow and the net absorption of glucose in sheep fed dried grass or ground maize-based diets 549

EVANS, S. A. and HOUGH, M. The effects of several husbandry factors on the growth and yield of winter-sown barley at four sites in each of three years 555

SUTHERLAND, R. A., WEBB, A. J. and KING, J. W. B. Evaluation of overseas pig breeds using imported semen. 1. Growth and carcass performance 561

SUTHERLAND, R. A. Evaluation of overseas pig breeds using imported semen. 2. Prediction of carcass lean content 571

PENNY, A., ADDISCOTT, T. M. and WIDDOWSON, F. V. Assessing the need of maincrop potatoes for late nitrogen by using isobutylidene di-urea, by injecting nitrification inhibitors with aqueous N fertilizers and by dividing dressings of 'Nitro-Chalk' . . 577

DROUSHIOTIS, D. N. Effect of grazing simulation on forage hay and grain yields of spring barleys in a low rainfall environment 587

DARBY, R. J., WIDDOWSON, F. V. and HEWITT, M. V. Comparisons between the establishment, growth and yield of winter wheat on three clay soils, in experiments testing nitrogen fertilizer in combination with aphicide and fungicides, from 1980 to 1982 595

RAWLINSON, C. J., MUTHYALU, G. and CAYLEY, G. R. Fungicide effects on light leaf spot, canker, crop growth and yield of winter oil-seed rape 613

JOHNSON, C. L. The effect of feeding in early lactation on feed intake, yields of milk, fat and protein and on live-weight change over one lactation cycle in dairy cows 629

WEIR, A. H., RAYNER, J. H., CATT, J. A., SHIPLEY, D. G. and HOLLIES, J. D. Soil factors affecting the yield of winter wheat: analysis of results from I.C.I. surveys 1979–80 . 639

GREATHEAD, K. D. and BARKER, D. J. The relationship between ultrasonic point readings in live cattle and carcass fat cover 651

REID, D. The seasonal distribution of nitrogen fertilizer dressings on pure perennial ryegrass swards 659

RODGERS, G. A., WIDDOWSON, F. V., PENNY, A. and HEWITT, M. V. Comparison of the effects of aqueous and of prilled urea, used alone or with urease or nitrification inhibitors, with those of 'Nitro-Chalk' on ryegrass leys 671

PAGE

SHORT NOTES

LUCAS, E. O. and SAGBOHAN, RITA. The effect of density of planting on yield and final nutrient uptake of two maize varieties in Nigeria 687

THIND, H. S., SINGH, BHAJAN and GILL, M. S. Effect of source and rate of nitrogen on grain yield of rice and wheat 691

POWELL, J. M. Assessment of dry-matter yield from grain yield in the West African Savannah Zone 695

SCOTT, N. M., DYSON, P. W., ROSS, J. and SHARP, G. S. The effect of sulphur on the yield and chemical composition of winter barley 699

FIRMAN, D. M. Gibberellic acid as a media additive for *in vitro* propagation of potato (*Solanum tuberosum* L.) 703